Service Manual

ELISA WASHER

Cat.-No.: 18441/2

CE

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1. INTRODUCTION

This manual provides information to help you troubleshoot and repair the electronic and mechanical parts of the MultiWash. Included are a functional description, troubleshooting and repair procedures.

For information about maintenance and calibration of the fluid-handling parts of the MultiWash (manifold, dispense pump, tubing, inlet line filters, etc.), please refer to the MultiWash Operation and Maintenance Manual.

2. SPECIFICATIONS

PERFORMANCE	
Resolution:	50ul
Accuracy:	±10%
Precision (repeatability) @ 300ul:	±5% CV
Processing Time (full plate):	350ul x 3 cyc x 8 port: 180sec.
	350ul x 3 cyc x 12 port: 125sec.
Residual aspiration volume:	5ul per well
Liquid contact materials:	Glass, Nylon, Stainless Steel,
	Tygon®, Teflon®, Delrin®
MECHANICAL/ELECTRICAL	
Dimensions (h x w x d):	8.4"h x 11"w x 14.5"d (213 x 279 x 368mm)
Weight:	10 lbs, unit only
	18 lbs, domestic shipping weight
	22 lbs, international shipping weight
Power requirements:	90-126VAC / 210-258VAC, 50-60Hz.
Power consumption:	30 watts maximum
Operating temperature:	10 to 40° C.
Storage temperature:	10 to 40° C.
Fluid reservoir capacity:	wash, rinse, waste: 2L.

3. FUNCTIONAL DESCRIPTION

Instructions entered from the Control Panel of the MultiWash by the operator are interpreted by a microcontroller on the Logic PCBA (Printed Circuit Board Assembly) to generate control signals for the motors and vacuum pump within the unit. There are four motors in the standard model:

1) Manifold vertical axis drive motor,
2) Manifold horizontal axis drive motor,
3) Dispense Pump drive motor and
4) Dispense Pump valve motor.

The MultiWash model equipped with the Auto Rinse Cycle feature uses an additional valve motor.

Opto interrupter (opto) transistors return position information from each of the motor driven assemblies. (except for the vacuum pump) This information signals the microcontroller that various steps in the operation have been completed and that the next operation can begin.

The microcontroller provides feedback to the operator through the LCD display and an audible signal. The display indicates the mode of operation that is currently selected. A single "beep" acknowledges each Control Panel key press. Two "beeps" should also be heard about one second after the Power Switch is turned "on" to indicate the MultiWash initialization has been successfully completed.

Operational modes selected at the Control Panel are initiated by pressing the START/STOP key. Any operation initiated by pressing the START/STOP key can be terminated by pressing this key a second time.

When the unit has been idle for 8 hours, the standard model and those equipped with the optional Auto Rinse Cycle feature automatically aspirates and refills the standby wells to prevent them from drying. This flushes the seals, valves and Manifold Needles to prevent drying and becoming clogged with crystallized wash solution.

The MultiWash equipped with the optional Auto Rinse feature, in addition to the above flush, purges the system of wash solution and replaces it with distilled water if the unit is inactive for a period of one hour.

4. GENERAL SERVICE INFORMATION

This section of the manual provides procedures regarding matters of safety and disinfection that must be observed when repairing the MultiWash. Also included is a list of tools and equipment required to perform repairs, a recommended replacement part inventory and a list of accessories.

The MultiWash is comprised of four field replaceable subassemblies. These are:

1) Logic PCBA,
2) Vacuum Pump,
3) Power Supply PCBA, and
4) Motor Driver PCBA.

Section 6 of this manual assists you with the identification of a malfunctioning subassembly.

Section 9 describes the procedures for the removal of faulty subassemblies.

4.1 SAFETY CONSIDERATIONS AND WARNINGS

4.1.1 ***WARNING*** - denotes procedures or conditions that may cause injury or loss of life if not properly performed. Do not continue past the WARNING sign until you completely understand the instructions that follow it.

This manual and procedures in it are intended to be used only by qualified service personnel who are knowledgeable and experienced in the repair of AC-line powered equipment and know proper procedures to avoid electrical shock. The MultiWash must never be plugged into the AC mains without a 3-Conductor Power Cord.

Only fuses of the specified type and rating, corresponding to the voltage of the AC line, are to be installed in the unit.

4.1.2 ***CAUTION*** - denotes procedures or conditions that may cause damage to the MultiWash if not properly performed. Do not continue past the CAUTION sign until you completely understand the instructions that follow it.

Whenever liquid supplies are connected, the plate washer must be operated only in its normal upright position to prevent fluid from getting inside the chassis. Take necessary precautions to prevent residual fluids from being ejected uncontrolled from tubing fittings if the unit is to be operated after disconnecting liquid supply and collection reservoirs.

4.2 DISINFECTION PROCEDURE

The MultiWash is subject to contamination by hazardous materials in the course of normal use. It is important that precautions are taken to protect service personnel from such contaminants.

Tri-Continent Scientific cannot anticipate the contaminants that may come in contact with the plate washer. Final responsibility for decontamination is up to the qualified service personnel.

Before proceeding with repair operations, try to determine the following:

Has the unit been contaminated by body fluids, toxic, carcinogenic, radioactive or other hazardous materials?

If the answer to the above is "yes," adequate procedures must be followed to decontaminate the MultiWash.

As a minimum, the following procedure should be performed before proceeding with any repair work.

1. Wear disposable rubber gloves and a lab coat while performing the following steps.
2. Use a cleaning pad wetted with a solution of one part chlorine bleach in four parts water (20% bleach solution) to clean all outside surfaces of the MultiWash. Use care to avoid getting bleach solution inside the chassis.
3. Dry the surfaces of the MultiWash with paper towels or other disposable wipes.
4. Use cotton swabs to clean and dry areas that are hard to reach.
5. After separating the Case Assembly from the Base and Rear Panel Assembly, carefully inspect the interior for signs of contamination. If contamination of the interior parts are suspected, clean them with a 20% bleach solution as described above. If the circuit board or any other electrical parts must be cleaned with bleach solution, all remaining solution must be rinsed away with clear water. Allow electrical parts and assemblies to dry thoroughly after cleaning before applying power to the MultiWash.

6. Properly dispose of used cleaning materials to insure no one becomes exposed to contaminants.
7. Keep in mind that this procedure does not guarantee total decontamination of the MultiWash.
8. Wear disposable gloves at all times while servicing.

4.3 TOOLS AND TEST EQUIPMENT

The following tools and test equipment are recommended to perform maintenance and repair on the MultiWash.

5/64" Allen wrench	Digital or analog multimeter
#2 Phillips screwdriver	Oscilloscope
1/4" nut driver	Test probe
5/16" nut driver	Soldering iron

4.4 RECOMMENDED SPARE REPLACEMENT PARTS

Item	Cat. Number
Carriage Alignment Tool Set	722
Carriage Assembly	723
Auto Rinse PCBA	724
Logic PCBA	756
Vacuum Pump	757
Power Supply PCBA	758
Motor Driver PCBA	759
Repair Manual	760
Test Cables	761
Waste Reservoir Cap/Probe Assembly	

4.5 RECOMMENDED SPARE PARTS INVENTORY

We recommend a minimum of one of each of the above spare parts to be held in inventory at each repair facility for every ten microplate washers purchased. Each repair facility should stock at least one of each spare part.

4.6 ACCESSORIES

Item	Cat. Number
100UM Filters (10/pack)	509
Red Dispense Needles (0.25" I.D.) 12/pack	516
Manifold, 8-port	748
Manifold, 12-port	749

Reservoir Kit	750
Maintenance Kit	751
Aerosol Shield	752

5. WARRANTY

5.1 WORKMANSHIP AND MATERIALS

The Plate Washer is warranted against defects in materials and workmanship for a period of one year from the date it is first placed in service, or delivered to the customer, whichever occurs first. If TCS receives notice of such defects during the warranty period, TCS will, at its option, either repair or replace products which prove to be defective.

5.2 EXCLUSIONS

The above warranty shall not apply to defects resulting from improper or inadequate maintenance by the customer, unauthorized modifications or service, misuse, operation outside of the environmental specifications for the product, or units returned with inadequate packaging. There is also no warranty expressed or implied for valves, syringe plungers or seals. For equipment damaged in shipping, contact the shipper.

5.3 RETURNS

Before returning any items, call Customer Service to obtain a Return Authorization (RA) number.

Any unit or accessory returned for repair MUST be clean and decontaminated. Contaminated items will not be accepted and will be returned to the user for proper cleaning. Units and/or accessories returned must be accompanied by a letter certifying either:

the returned items have not been contaminated by body fluids, or toxic, carcinogenic or radioactive materials, or other hazardous materials.

OR

the returned items have been decontaminated (See Section 4.2) and can be handled without exposing personnel to health hazards.

5.4 CUSTOMER ASSISTANCE

Assistance with operation or repair of the Plate Washer is available by contacting:

6. CONTROLS FOR INITIALIZATION AND TEST

6.1 INITIALIZE E²PROM TO DEFAULT VALUES

Hold specified key while turning on the power (required for very first power-up of a new logic board):

UNIT WITH AUTO-RINSE VALVE:	SELECT KEY
UNIT WITHOUT AUTO-RINSE VALVE:	WASH KEY

6.2 LIFE TEST

Hold specified key while turning on the power: START/STOP KEY

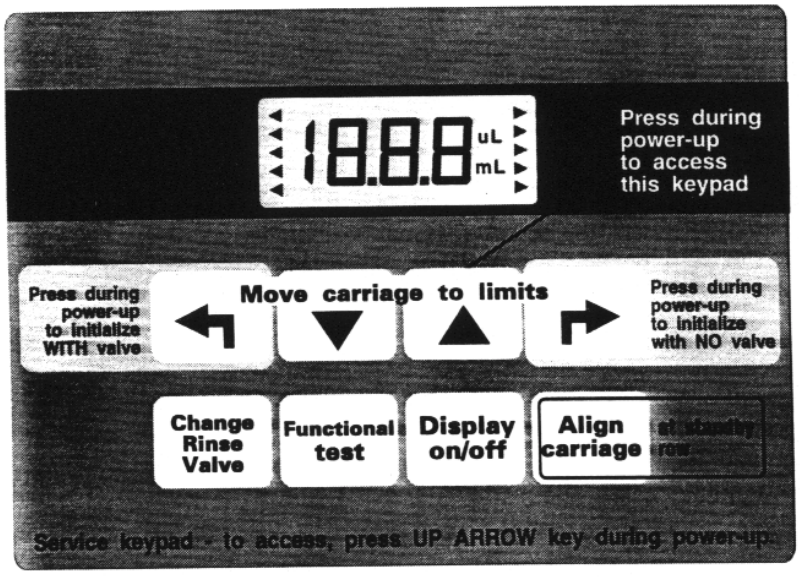
(continuous operation at parameters of PGM 1)

6.3 DISABLE WASTE LEVEL SENSOR

(temporarily) for service purposes. Sensor will be re-enabled upon next power-up.

Hold PRIME key while turning on the power

Figure 1


188.8 uL mL
Press during power-up to access this keypad
Press during power-up to initialize WITH valve
Move carriage to limits
Press during power-up to initialize with NO valve
Change Rinse Valve
Functional test
Display on/off
Align carriage
Service keypad - to access, press UP ARROW key during power-up

7. SERVICE KEYPAD

The Service Keypad is a reassignment of the functions of the control panel, and is accessed by holding the "+" key while turning power on. Figure 1 shows the reassigned functions for this facility. Pressing the Functional Test key initiates tests 1 through 8, which determine if the motor drivers on the Logic PCBA and the motors and opto devices on the mechanical assemblies function properly. Perform the appropriate troubleshooting procedure corresponding to the failed test if an error number shows on the LCD.

7.1 FUNCTIONAL TEST

Moves carriage motors to confirm operation of motor drivers, opto inputs. Unit beeps twice if it functions ok, otherwise it shows an error number. Check error number against list below.

TEST #	Function tested
1	V-axis motor moves to limit, and limit opto is confirmed active.
2	V-axis motor moves away from limit, and limit opto is confirmed inactive.
3	H-axis motor moves to limit, and limit opto is confirmed active.
4	H-axis motor moves away from limit, and limit is confirmed inactive.
5	Pump valve changes to reservoir position.
6	Pump motor moves to limit, and limit opto is confirmed active.
7	Pump motor moves away from limit, and limit opto is confirmed inactive.
8	Pump valve changes to delivery position.

TWO BEEPS = PASS

7.2 OTHER FUNCTIONS OF SERVICE KEYPAD

Display on/off - blanks and activates all display segments for inspection, and for setting the display contrast/viewing angle control on the logic PCB.

Align carriage- sets manifold in position for alignment of the carriage to the alignment fixture inserted into the standby row slot.

Change rinse valve- If equipped with the auto-rinse valve, this key will toggle between the WASH and RINSE positions. Use this keystroke to operate the valve when aligning the opto wheel on the valve PCB assembly.

8. TROUBLESHOOTING

This section of the manual assists you with isolating the cause of failures or malfunctions to a subassembly level. After identification of the subassembly causing the problem, refer to Section 9 of this manual to find procedures for removal and replacement.

8.1 SAFETY CONSIDERATIONS AND WARNINGS

Many of the following troubleshooting procedures require applying power to the plate washer with the Rear Panel or Case Assembly separated from the Base Assembly. It is important for your safety to observe precautions to avoid electrical shock or other injury. Be certain you are familiar with Section 4.1, Safety Considerations and Warnings, prior to troubleshooting.

8.2 TROUBLESHOOTING PROCEDURES

This equipment includes a Functional Self Test, to aid in isolating inoperative portions of the unit. This test is initiated by pressing the Self test key on the Service Keypad.

Begin troubleshooting by inspecting for the obvious. Check for broken mechanical parts, loose and disconnected cables and wires, etc.

Observe the plate washer in operation and compare the way it functions to the descriptions of proper operation as described in the Functional Description, Section 3 of this manual and in the *Operation and Maintenance Manual, Section 5.* Compare discrepancies observed with the symptoms in this section to find the most logical place to begin detailed troubleshooting.

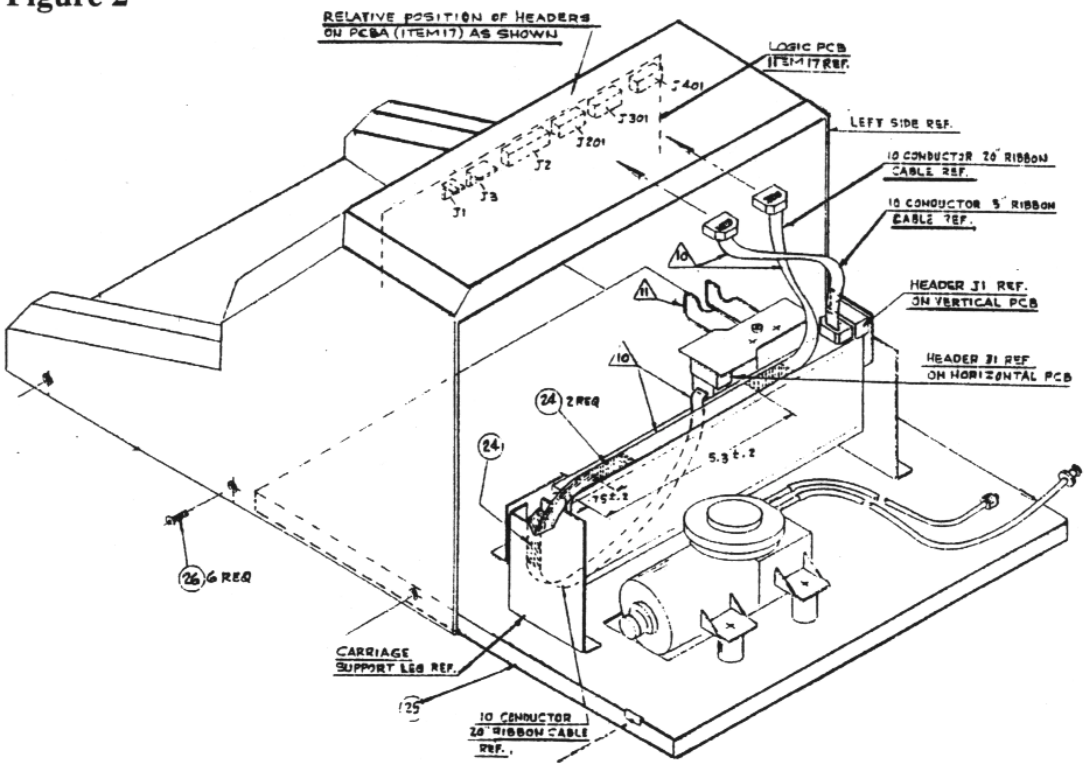
8.2.1 Unit is Inoperative

1. Check power source: 90-126 / 210-258VAC, 50-60 Hz
2. Check fuse: 1/2 A, Slow Blow / 90-126 VAC operation
   1/4 A, Slow Blow / 210-258 VAC operation
3. Check voltage selector. Voltage displayed in window must agree with power line voltage.
4. Disconnect the AC power.
5. Remove Screws to release the Case from the Rear Panel and Base Assembly.
6. Disconnect the power cable plug, P3, from J3 on the Logic PCBA. (See Figure 2.)

WARNING ***Avoid contact with live electrical circuits and moving mechanical parts.***

7. Apply AC power and check the voltages at J3 on the power supply assembly. (Figure 3).
   J3-2 / +5 VDC
   J3-3 / +17-19 VDC
   J3-4 / +37-39 VDC
8. Replace the Logic PCBA if the voltages are correct.
9. Replace the Power Supply PCBA if the voltages are incorrect.
10. If the problem persists, send the unit to the factory or a qualified service person for repair.

Figure 2



8.2.2 No Response to Control Panel Key Presses / No Audible "Beeps"

1. Disconnect the AC power.
2. Remove screws to release the case from the Rear Panel and Base Assembly. Leave all connectors attached except for the Power Supply Connector (P3), connected to J3 on the Logic PCBA. (See Figure 2.)

WARNING ***Avoid contact with live electrical circuits and moving mechanical parts.***

3. Apply AC power and check the voltages at J3 on the power supply assembly. (Figure 3).

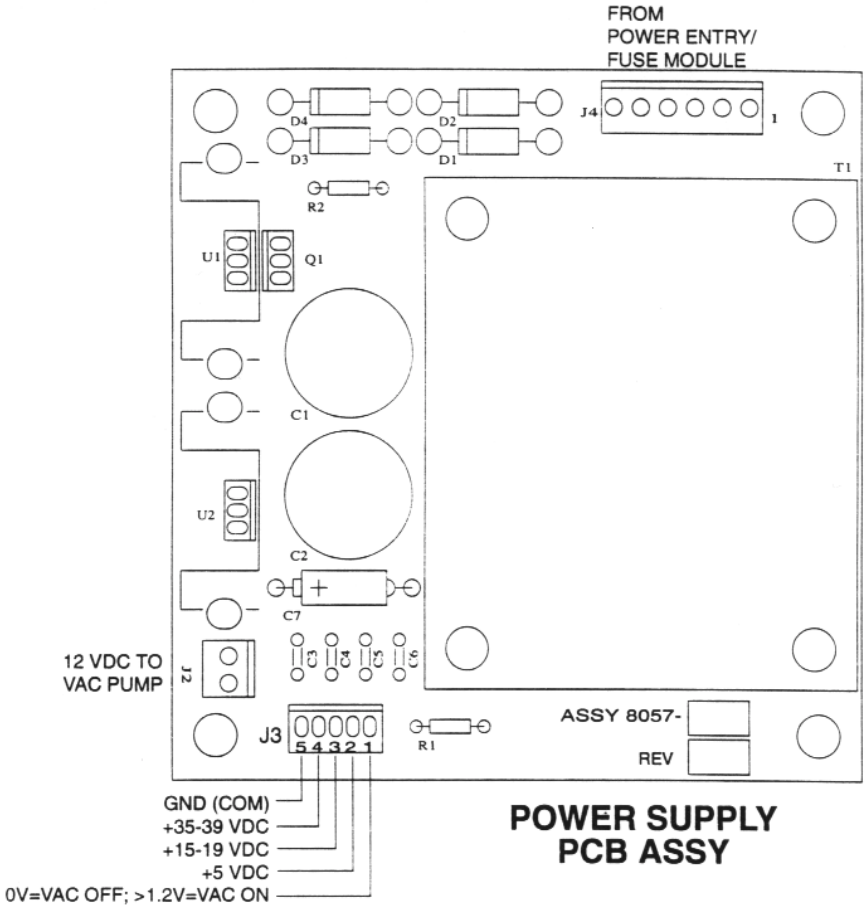
   J3-2 / +5 VDC

   J3-3 / +17-19 VDC

   J3-4 / +37-39 VDC

4. Replace the Power Supply PCBA if the voltages are incorrect.
5. If the voltages are correct, disconnect the AC power and remove the Logic PCBA and make certain the Ribbon Cable from the Keypad is properly connected to J4 on the Logic Board.
6. Reconnect the Logic PCBA to the Case Assembly.
7. Reconnect P3 to J3 on the Logic Board.
8. Connect the AC power.
9. If the problem remains, replace the Logic PCBA.
10. If the problem persists, send the unit to the factory or a qualified service person for repair.

Figure 3 - Voltage measurements



8.2.3 Manifold Horizontal / Vertical Axis Failure, Self Test Failures # 1 to 4

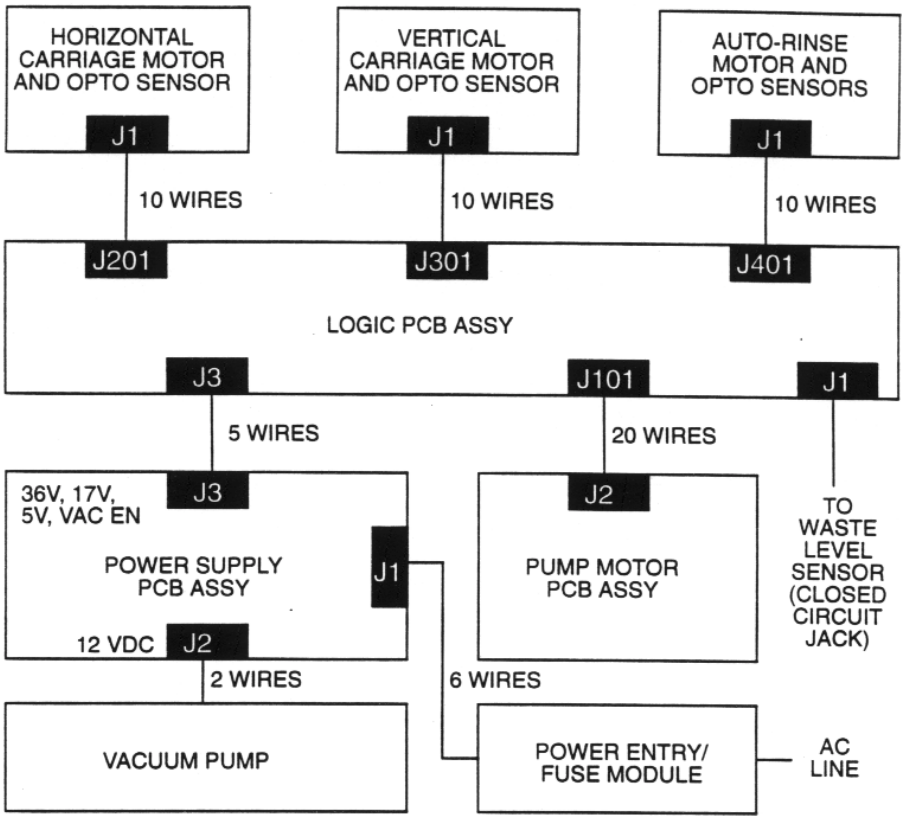
1. Disconnect the AC power.
2. Remove Screws to release the Case from the Rear Panel and Base Assembly.
3. Install the Test Cables. (cat.# 761)
4. Connect the AC power.
5. Perform the Self Test again. (See Figure 1.)
6. Order replacement cables if the problem is resolved.

WARNING ***Avoid contact with live electrical circuits and moving mechanical parts.***

7. If the failure persists, disconnect the AC power and disengage P3 from J3 on the Logic PCBA. (See Figure 2).
8. Apply AC power and check the voltages at J3 on the power supply assembly. (Figure 3).

   J3-2 / +5 VDC

BLOCK DIAGRAM



J3-3 / +17-19 VDC

J3-4 / +37-39 VDC

9. Disconnect the AC power and replace the Power Supply PCBA if the voltages are correct.
10. Disconnect the AC power and replace the Logic PCBA if the voltages are correct.
11. If the unit is still inoperative, disconnect the AC power and replace the Carriage assembly.
12. If the unit remains inoperative, disconnect the AC power, install the original assemblies and send the unit to the factory or a qualified service person for repair.

8.2.4 Dispense Pump Drive or Valve Motor Failure, Self Test Failures # 5 to 8

1. Disconnect the AC power.
2. Remove Screws to release the Case from the Rear Panel and Base Assembly.
3. Install the Test Cables. (cat.# 761)
4. Connect the AC power.
5. Perform the Self Test again. (See Figure 1.)
6. Order replacement cables if the problem is resolved.

WARNING ***Avoid contact with live electrical circuits and moving mechanical parts.***

7. If the failure persists, disconnect the AC power and disengage P3 from J3 on the Logic PCBA. (See Figure 2.)
8. Apply AC power and check the voltages at J3 on the power supply assembly. (Figure 3).

   J3-2 / +5 VDC

   J3-3 / +17-19 VDC

   J3-4 / +37-39 VDC
9. Disconnect the AC power and replace the Power Supply PCBA if the voltages are incorrect.
10. Disconnect the AC power and replace the Logic PCBA if the voltages are correct.
11. If the unit is still inoperative, disconnect the AC power and replace the Motor Driver PCBA.
12. If the unit remains inoperative, disconnect the AC power, install the original assemblies and send the unit to the factory or a qualified service person for repair.

8.2.5 Vacuum Pump Does Not Operate

1. Disconnect the AC power.
2. Remove the screws to release the Case from the Rear Panel and Base Assembly.
3. Connect the AC power.
4. Initiate the Life Test accessed through the Service Keypad. (See Figure 1.)

WARNING ***Avoid contact with live electrical circuits and moving mechanical parts.***

5. Disconnect P3 from J3 on the Logic PCBA.
6. If the Vacuum Pump begins to operate, disconnect the AC power and replace the Logic PCBA.
7. Check for 11-12 VDC across the terminals of the Pump if it remains inoperative.
8. Disconnect the AC power and replace the Power Supply Assembly if the voltage is not present.
9. Disconnect the AC power and replace the Vacuum Pump if the voltage is present.

8.2.6 Vacuum Pump Operates Continuously

1. Disconnect the AC power.
2. Remove the screws to release the Case from the Rear Panel and Base Assembly.
3. Connect the AC power.
4. Initiate the Life Test accessed through the Service Keypad. (See Figure 1.)

WARNING ***Avoid contact with live electrical circuits and moving mechanical parts.***

5. Disconnect P3 from J3 on the Logic PCBA.
6. Short the black and green wire contacts on P3. The Vacuum Pump should stop.
7. Disconnect the AC power and replace the Logic Board if the Pump stops.
8. If the Vacuum Pump continues to operate, disconnect the AC power and perform a continuity test of the Power Supply Cable connecting the Logic PCBA to the Power Supply PCBA.
9. Replace the Power Supply if the cable is good and the Pump continues to run.

8.2.7 Waste Reservoir is Full and "FULL" is not Displayed.

1. Unplug the Waste Reservoir Probe connected to the Rear Panel Assembly.
2. The circuit is now shorted and "FULL" should be indicated on the LCD.
3. If "FULL" is not indicated, replace the Waste Reservoir Cap/Probe Assembly.
4. If "FULL" is still not indicated, replace the Logic PCBA.

8.2.8 Auto Rinse Valve Does Not Switch to the Rinse Reservoir

1. Perform the Auto Rinse Valve functional test. (See Figure 1.)
2. If the valve position can not be changed between the two position, disconnect the AC power.
3. Remove Screws to release the Case from the Rear Panel and Base Assembly.
4. Disengage P3 from J3 on the Logic PCBA. (See Figure 2.)

WARNING ***Avoid contact with live electrical circuits and moving mechanical parts.***

5. Apply AC power and check the voltages at J3 on the power supply assembly. (Figure 3).

   J3-2 / +5 VDC

   J3-3 / +17-19 VDC

   J3-4 / +37-39 VDC

7. Disconnect the AC power and replace the Power Supply PCBA if the voltages are incorrect.
8. Disconnect the AC power and replace the Auto Rinse PCBA if the voltages are correct.
9. If the Auto Rinse Valve is still inoperative, disconnect the AC power and replace the Logic PCBA.
10. If the unit remains inoperative, disconnect the AC power, install the original assemblies and send the unit to the factory or a qualified service person for repair.

9. REMOVAL AND REPLACEMENT PROCEDURES

This section of the manual describes how to remove subassemblies to facilitate replacement or repair. In most cases, replacing a subassembly will be a simple matter of reversing the removal procedures.

9.1 SAFETY CONSIDERATIONS AND WARNINGS

Before performing any of the procedures in this section of the manual, read Section 4.1 and 4.2. These sections define health and safety hazards that must be considered when servicing the plate washer and procedures to follow to protect yourself and the unit from these hazards.

9.2 REMOVING AND REPLACING THE FUSE

1. ***WARNING*** - Disconnect the AC power cord from the power entry module.
2. Locate the latch at the bottom of the fuse drawer of the power entry module.
3. Insert the tip of a small screwdriver under the latch and lift the latch upward until it releases and allows the fuse drawer to slide out of the power entry module.
4. Remove the fuse from the fuse drawer and replace it with a new one.

CAUTION - for 90-126VAC operation use a 1/2 Amp, Slow Blow Fuse.

- for 210-258VAC operation use a 1/4 Amp, Slow Blow Fuse.

5. Slide the fuse drawer back into the Power Entry Module making certain the drawer latches into place.

9.3 REMOVING THE CASE FROM THE REAR PANEL AND BASE ASSY.

CAUTION - The MultiWash must be operated only in its normal upright position whenever liquid supplies are connected to prevent fluid from getting inside the chassis. Take necessary precautions to prevent residual fluids from being ejected from tubing fittings if the unit is to be operated after disconnecting liquid supply and collection reservoirs.

1. Position the Manifold Support Arm so it will easily pass through the opening in the Case. This is accomplished by applying power, then pressing the Start/Stop Key to initiate a Wash process. When the Support Arm rises, immediately turn off the power stopping the Support Arm in the center of the Case opening.
2. Disconnect the Power Cord from the AC line.
3. Disconnect the Tubing from the Manifold.
4. Remove the Manifold from the manifold support arm.
5. Use a 5/64" Allen wrench to remove nine 6-32 flat head screws located on the sides of the Case Assembly at the base and at the top of the Rear Panel Assembly.
6. Remove the gray cap from the conduit that contains the Manifold Tubing.
7. Lift the back of the Case over the edge of the Rear Panel.
8. Gently separate the Case from the Rear Panel by pulling the Case forward approximately four inches.
9. Disconnect all cables from the Logic PCBA located inside the Case under the Keypad. (See Figure 2.)
10. Continue to pull the Case away from the Rear Panel while guiding the Manifold Tubing through the Conduit.

9.4 Separating the Rear Panel from the Case and Base Assy.

1. Use a 5/64" Allen wrench to remove three 6-32 button head screws located at the bottom of the Rear Panel along the Base.
2. Use a 5/64" Allen wrench to remove three 6-32 flat head screws located at the top of the Rear Panel Assembly.
3. Disconnect the vacuum pump tubing from the back of the pump exhaust filter.
4. From the back of the Rear Panel, pull the Vacuum Pump to Waste Reservoir Tubing through the hole in the Rear Panel.
5. The Rear Panel is now disconnected.

9.5 Removing the Power Supply from the Rear Panel Assy.

1. Separate the Rear Panel from the Base and Case Assembly. (See Section 9.4)

2. Disconnect the cables from J2, J3 and J4 on the Power Supply PCBA.
3. Use a 5/64" Allen wrench to remove four 6-32 button head screws, connecting the Power Supply to the Rear Panel, located at each corner of the Power Supply Assembly directly behind the Power Supply PCBA on the Rear Panel. Support the Assembly as the last two screws are removed.
4. The Power Supply is now disconnected.

9.6 Removing the Vacuum Pump from the Base Assy.

1. Separate the Rear Panel from the Base and Case Assembly. (See Section 9.4)
2. Disconnect the Vacuum Pump Tubing.
3. Unplug the Vacuum pump cable from the Power Supply PCB assy.
4. Use a Phillips #2 screwdriver to remove three 6-32 pan head Phillips screws located under the Base Assembly connecting the Vacuum Pump to the Base.
5. Lift the Vacuum Pump upward and out of the Plate Washer.

9.7 Removing the Logic PCBA from the Case Assy.

1. Remove the Rear Panel from the Case and Base Assembly. (See Section 9.4)
2. Use a 1/4" nut driver to remove the four #4 hex locking nuts connecting the Logic PCBA to the Case Assembly.
3. Carefully pull the Logic Board a few inches from the Case.
4. Disconnect the Ribbon Cable from the Logic Board coming from the Keypad.
5. Remove the Logic PCBA.

9.8 Disconnecting the Pump Motor PCBA from the Rear Panel

1. Separate the Rear Panel from the Base and Case Assembly. (See Section 9.4)
2. Disengage the connectors from J1 and J2 on the Motor Driver PCBA.
3. Use a 1/4" nut driver to remove the four #4 hex locking nuts holding the Motor Driver PCBA to the Rear Panel Assembly.
4. The Power Supply is now disconnected.

9.9 Disconnecting the Auto-Rinse PCBA from the Rear Panel

1. Separate the Rear Panel from the Base and Case Assembly. (See Section 9.4)
2. Disengage the connectors from J1, J2, and J401 on the Logic PCBA.
3. Use a 1/4" nut driver to remove the four #4 hex locking nuts holding the Auto Rinse Valve PCBA to the Rear Panel Assembly.

9.10 Disconnecting the Carriage Assy. from the Base Assy.

1. Remove the Case from the Rear Panel and Base Assembly. (See Section 9.3)
2. Use a 5/16" nut driver to remove the two 10-32 slotted hex head nuts and spring washers located under the Base Assembly connecting the Carriage Assembly To the Base.

9.11 Disconnecting the Auto-Rinse PCBA from the Rear Panel Assy.

1. Separate the Rear Panel from the Base and Case Assembly.
2. Disengage the connectors from J1, J2, and J401 on the Logic PCBA.
3. Use a 1/4" nut driver to remove the four #4 hex locking nuts holding the Auto Rinse Valve PCBA to the Rear Panel Assembly.

10. CARRIAGE ALIGNMENT

1. Support the plate washer in a level, upright position about 6-7 inches above the workbench so that you have hex-driver access to the two 5/16" hex-head machine screws on the bottom of the unit. (The manufacturer uses a special frame for this, however, two equal height boxes will work fine for field alignment).
2. Install a standby-row strip well, and a microplate onto the unit.
3. Turn on the unit and initialize, following the instructions in section 6.1.
4. Press START to begin a Wash-1 cycle. The manifold support will move to row 1 and dive. When the manifold support rises from row 1, press START/STOP to abort the wash.
5. Insert a manifold into the support arm, and observe the position of the long steel needles, relative to row 1 of the microplate.
6. Loosen the two hex-head screws, *but do not remove them.*
7. Nudge the carriage into position so that the needles align both **front-to-back** and **left-to-right** with the edge of the row 1 wells. *Do not touch the manifold or the manifold support arm while doing this.*
8. Tighten the two 5/16" machine screws.
9. Using the Service Keypad (power on while holding the "+" key), press the WASH key to move the manifold to the far right position, and confirm the the movement of the manifold is still in line with the microplate at row 12.
10. Power off, power back on, and verify the alignment by performing a normal 12 row wash routine.

11. MANIFOLD ALIGNMENT (from Operation Manual)

Best aspirate performance (leaving the minimum liquid in the plate wells) is obtained when the aspirate needle is close to the wall of the plate well (flat bottom wells). Calibrating the manifold position can compensate for variations in microplate products from different manufacturers. Repositioning the needles to the recommended .02" (.5mm) from the left-side wall (flat bottom), or the well centerline (U/V- bottom) is done as follows. No liquid is dispensed in this procedure.

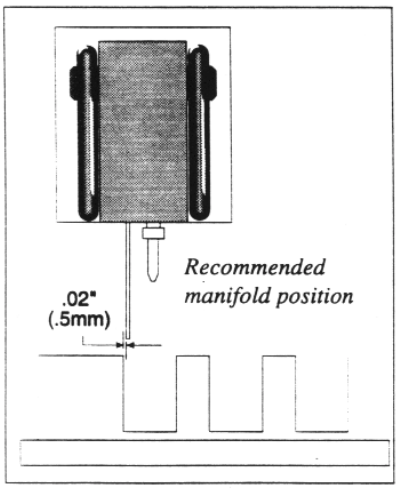
1. Place the microplate in the plate-holder.
2. Press and hold [Select / REVIEW]. After holding the key for about 4 seconds, the unit will beep and display CAL.

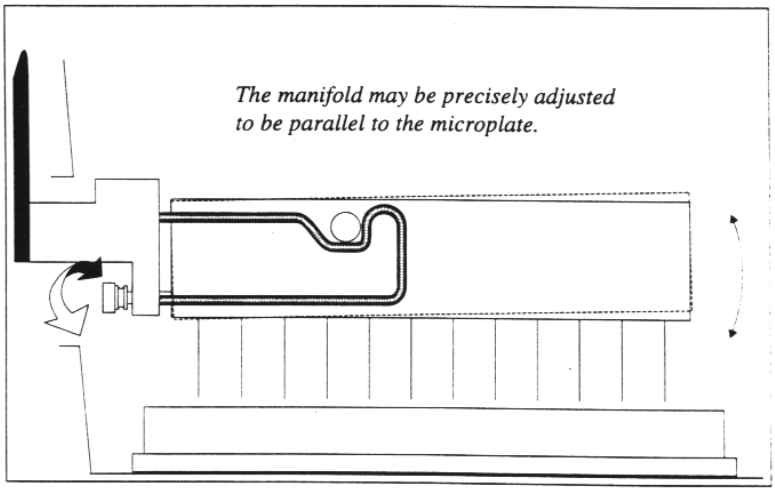
3. Press [Start / Stop]. The manifold will rise and move to the first row. The display will show a number in the range of 375-425. This number represents the position of the manifold at row #1.
4. Press [▲] to move the manifold to the right, or [▼] to move it to the left. Each press of the key will produce approximately .002" movement. The display will add or subtract 1 count for each press of a key.

EXAMPLE: If the aspirate needles are determined to be too near the well wall, press [▲] while observing needle positioning. If [▲] is pressed five times, the needle will move approximately .010".

5. Press [Start / Stop] to accept this setting, and to return the manifold to the standby row.

NOTE: The [U / U V] key automatically repositions the manifold for the optimal centerline position when the U/V is indicated. No further calibration is required unless the needles fail to position themselves at centerline.



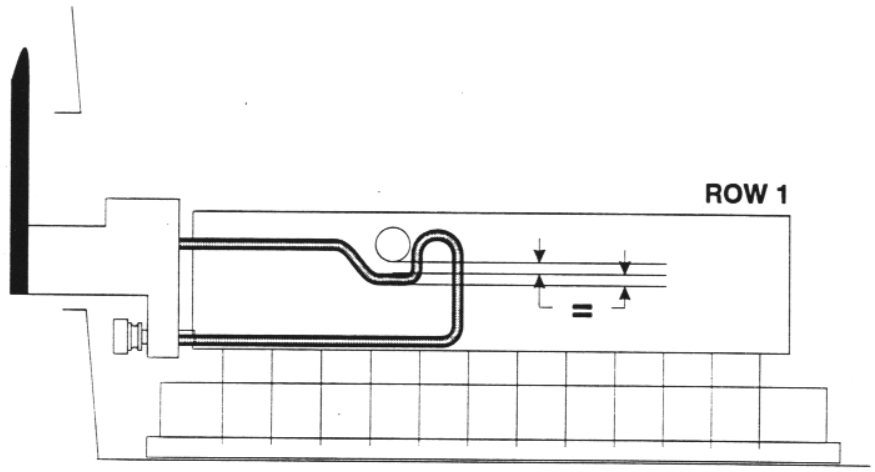


12. MANIFOLD DIVE DEPTH ADJUSTMENT

Before doing this, be sure to initialize the unit, following the instructions in section 6.1.

1. Press and hold SELECT, until "CAL" displays.
2. Press WASH. "L" displays, showing that you are in the manifold depth setting routine.
3. Press START. The manifold moves to row 1 of the plate and dives.
4. Use the ARROW keys to adjust the manifold depth so that the dive overtravel is equal to 1 wire diameter. See illustration. Note the number on the display.

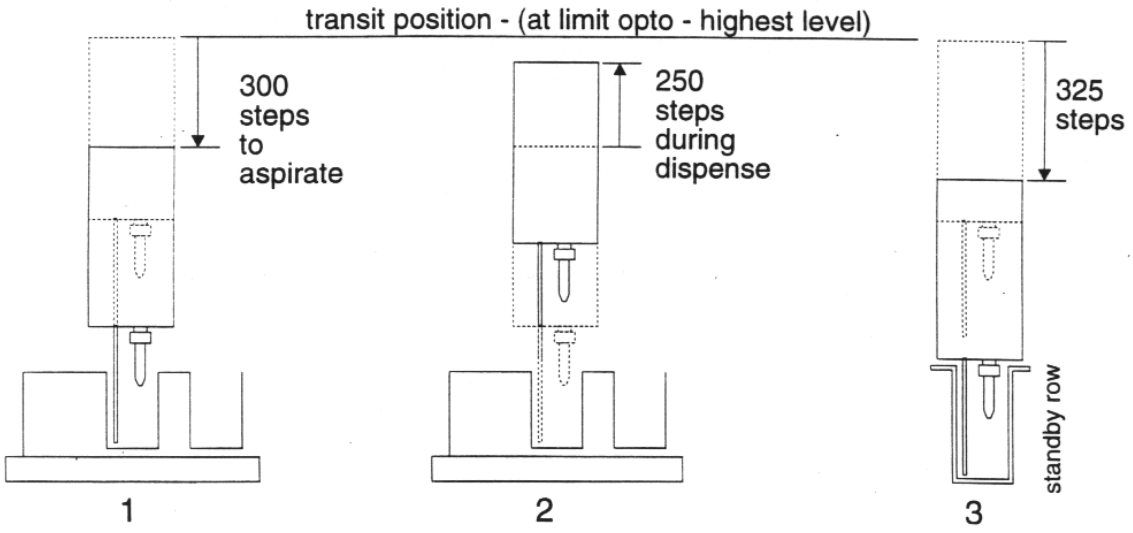
NOTE: When making this adjustment, press the arrow keys once for each step. If the arrow keys are held down to auto-repeat, units with an earlier version of firmware will lose synchronization between the manifold position and the displayed step count. To re-synchronize, initialize the unit, following the instructions in section 6.1.



5. Press START to accept that setting. The manifold rises and "250" displays. Do not adjust this number.
6. Press START. The manifold will dive into the standby row. Press the ARROW keys to set the display to 25 + the number displayed in step #4.

Example: If the number on the display in step #4 was 310 when the manifold was adjusted as shown in the illustration, then the setting for this step would be 25 + 310, or 335. If the sum is greater than 350 (the maximum entry), set for 350. The needles need not touch the bottom of the standby row wells.

7. Press START to exit the calibration mode.



12.1 How the Multiwash manifold depth setting works

(After holding SELECT until "CAL" displays, then pressing WASH to display "L", then pressing START, and the manifold with move to the plate and dive).

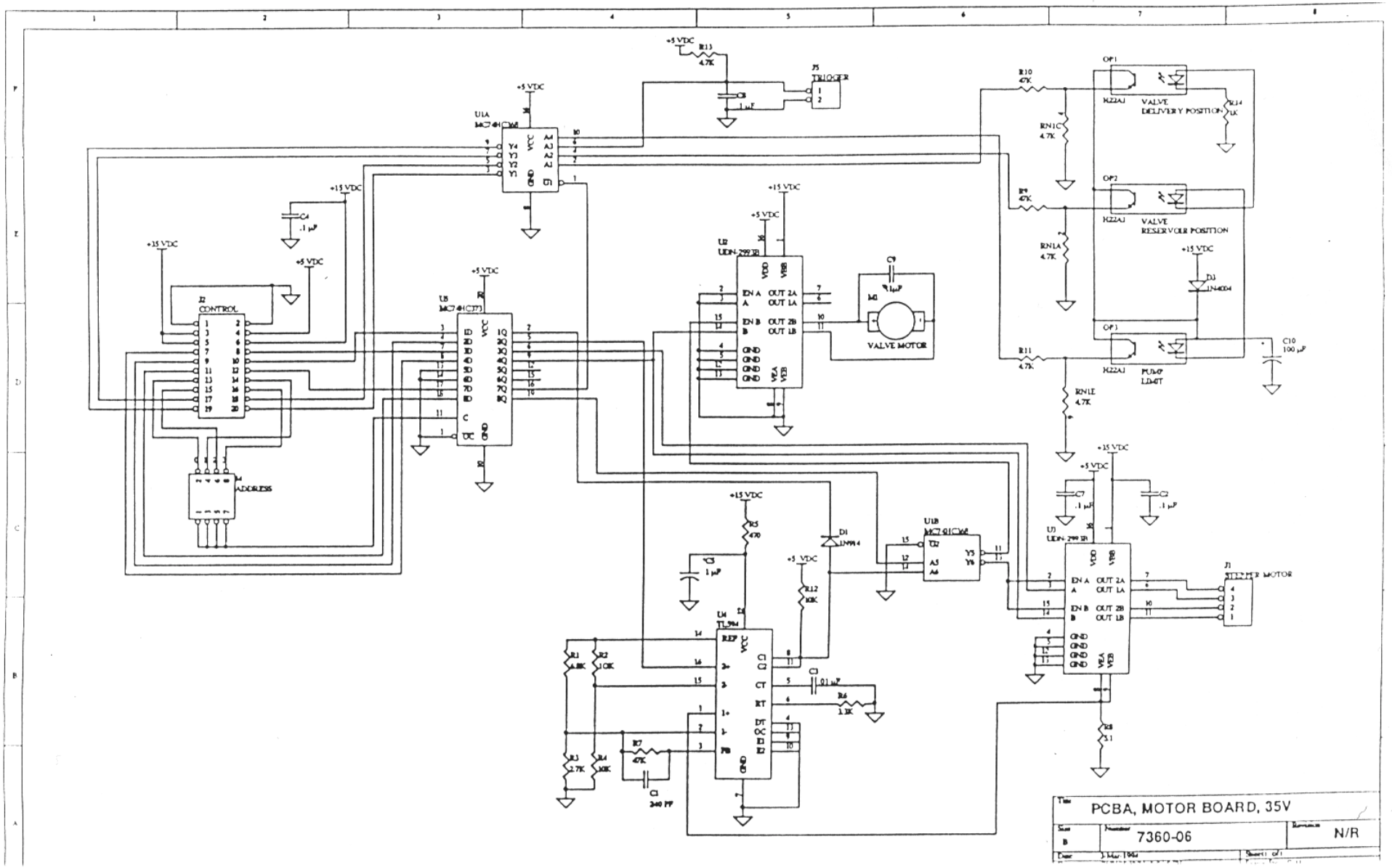
#1 -- Adjust the dive steps until the needles are at the desired depth.

NOTE: You cannot set the dive to a smaller number of steps than #2 will raise the manifold. If you do, you will get an E04 error, telling you that when #2 tries to rise by 250 steps, there are less than 250 steps of travel available. If you do force this setting, the unit will not operate properly, and will cause an improper dive and delay during the aspirate part of a wash cycle.

If you must set #1 to less than 250, you must *first* go through the depth cal procedure and reduce the #2 reading to a value *less than what you will be setting the #1 value to.* Then enter the depth cal routine again, and make your reduced dive setting.

#2 -- Generally this number is not changed, since it relates only to the thickness of the plate.

#3 -- This sets the depth of dive into the standby row, which has deeper wells than a standard microplate.


PCBA, MOTOR BOARD, 35V
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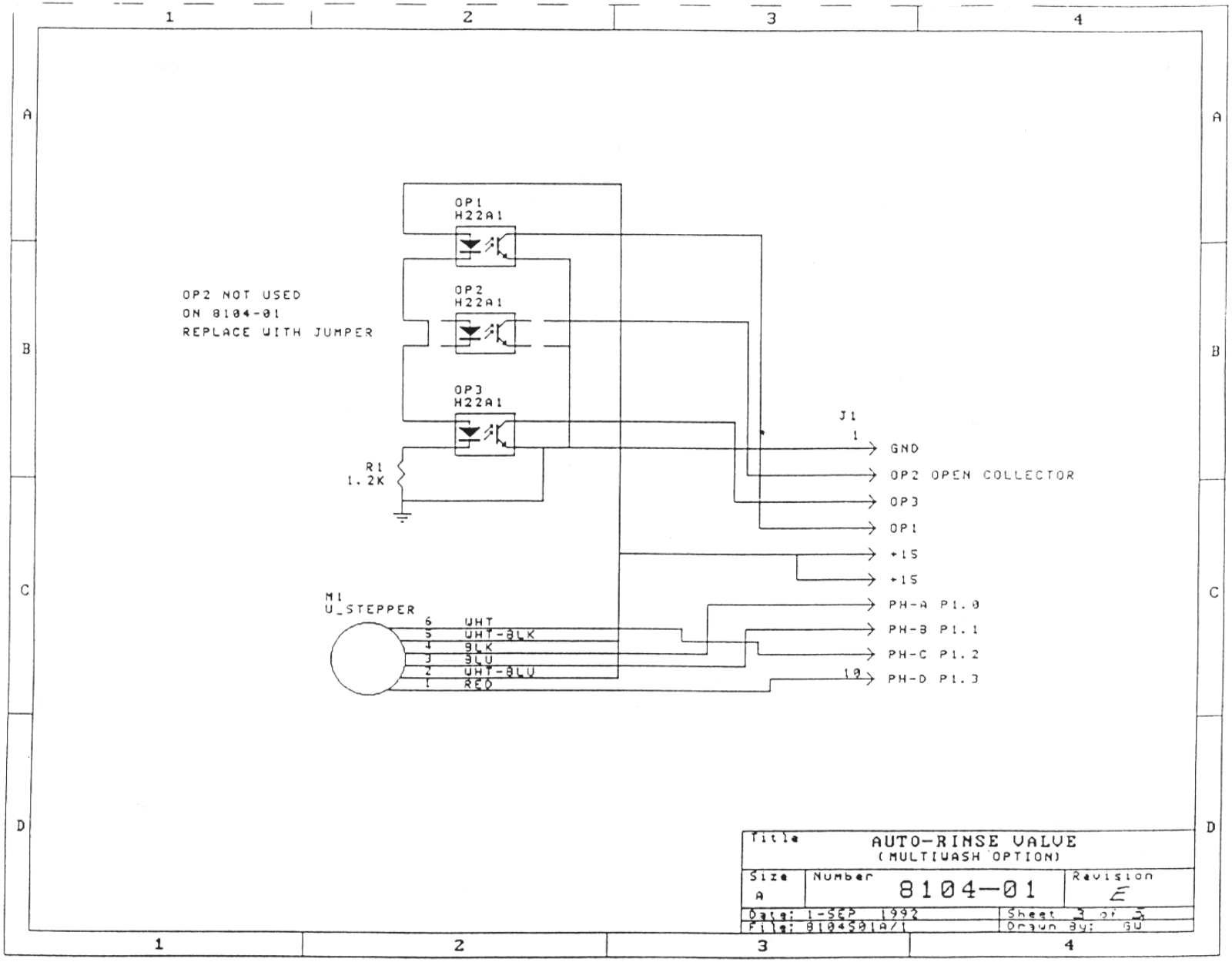
VALVE DELIVERY POSITION
VALVE RESERVOIR POSITION
PUMP LOAD
STEPPER MOTOR
+5 VDC
+15 VDC


1
2
3
4
A
B
C
D
OP1
H22A1
OP2
H22A1
OP3
H22A1
OP2 NOT USED
ON 8104-01
REPLACE WITH JUMPER
R1
1.2K
M1
U_STEPPER
6 UHT
5 UHT-BLK
4 BLK
3 BLU
2 UHT-BLU
1 RED
J1
1 GND
OP2 OPEN COLLECTOR
OP3
OP1
+15
+15
PH-A P1.0
PH-B P1.1
PH-C P1.2
10 PH-D P1.3
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AUTO-RINSE VALVE
(MULTIWASH OPTION)
Size
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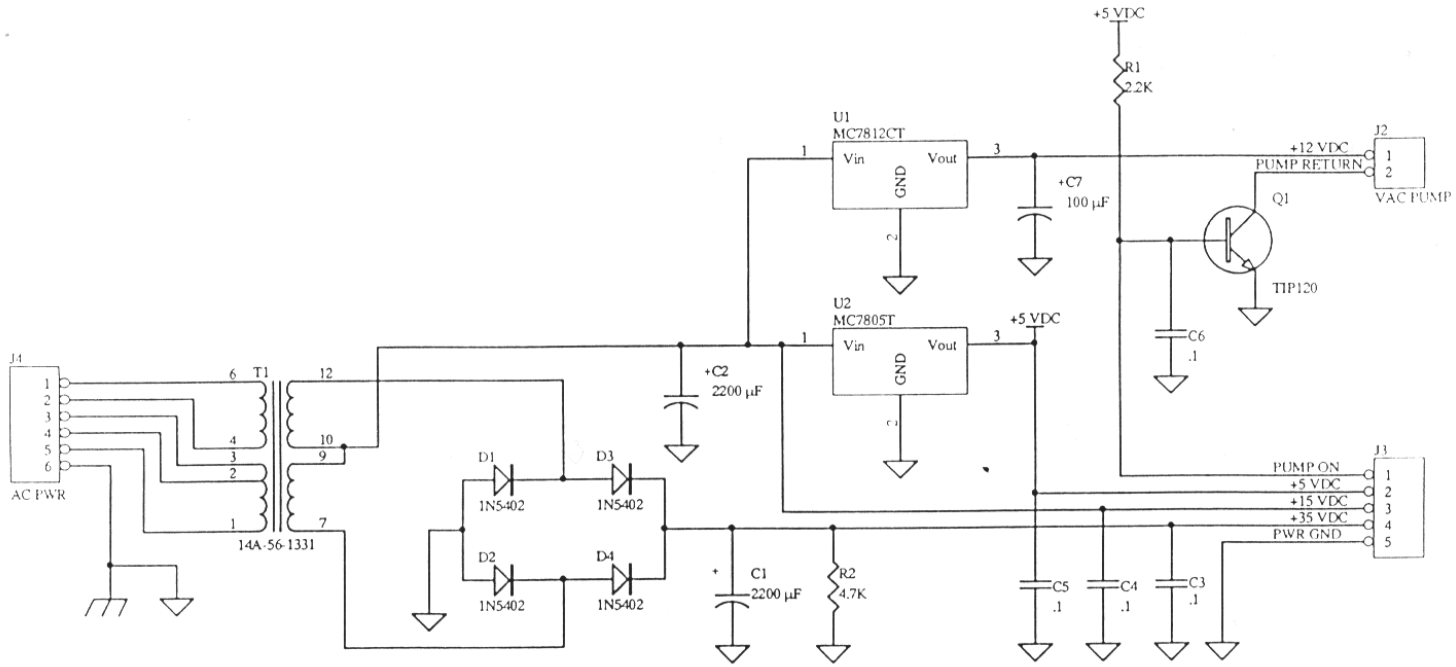
Number
8104-01
Revision
E
Date: 1-SEP 1992
File: 8104S01A/1
Sheet 3 of 3
Drawn By: GU



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Date: 13-Apr-1994		Sheet 1of 1
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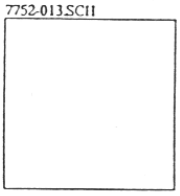
USER INTERFACE
7752-012.SCH

CARRIAGE CONTROL
7752-013.SCH



RINSE CONTROL
7752-014.SCH

NOT USED: C5, 6, 17

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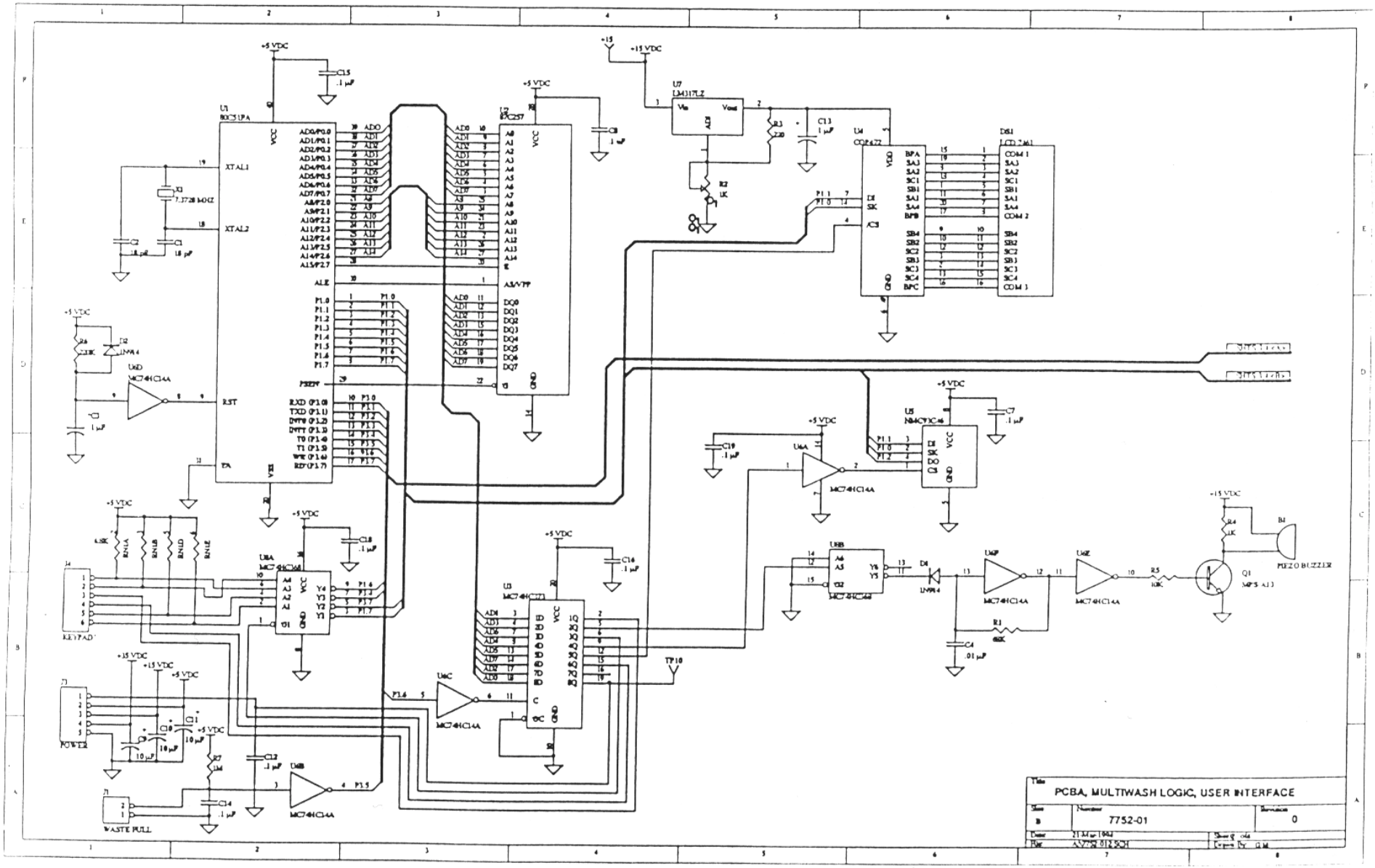
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7752-01
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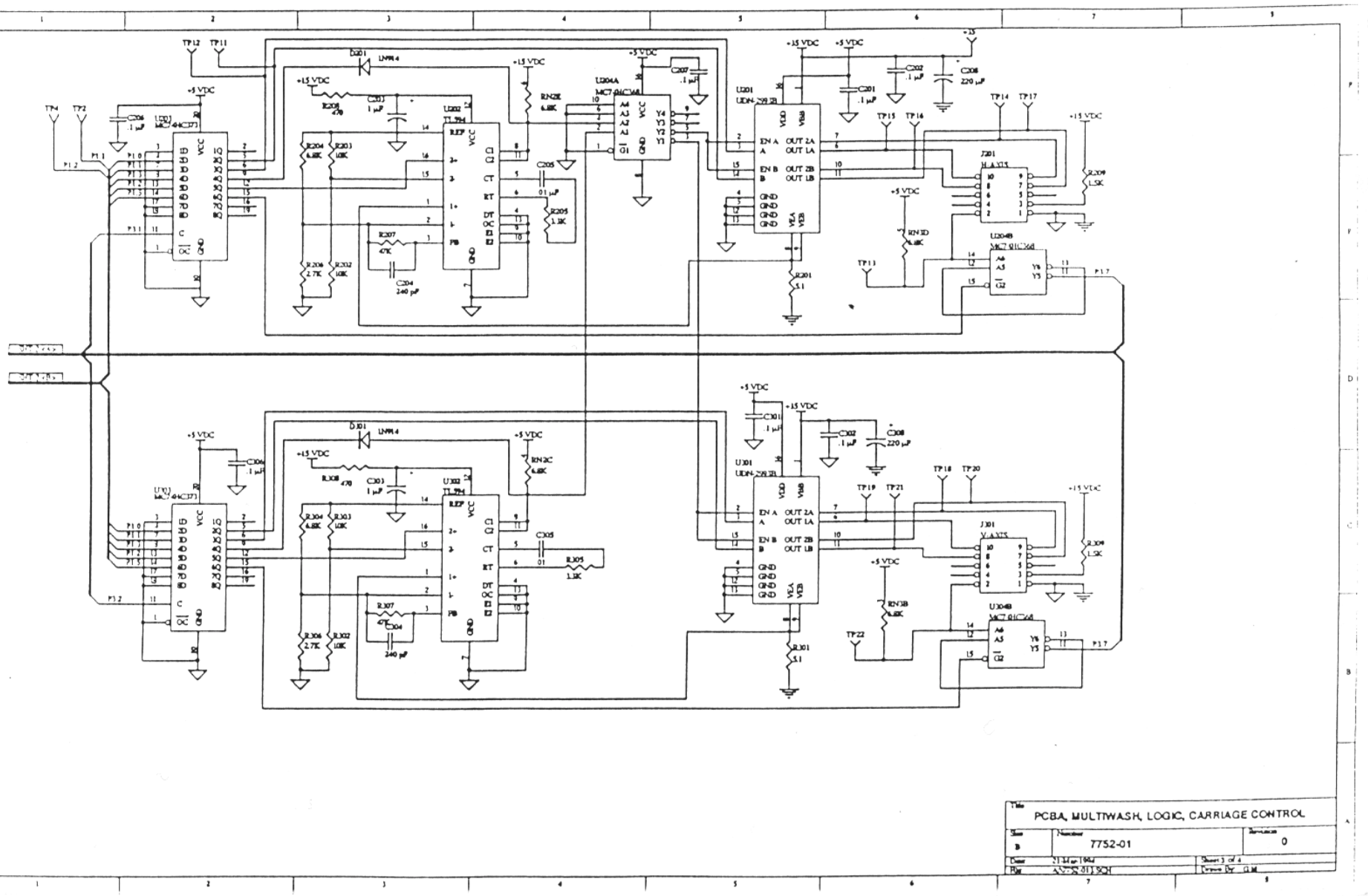
KEYPAD
POWER
WASTE PULL
PIEZO BUZZER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B
Sheet 3 of 4
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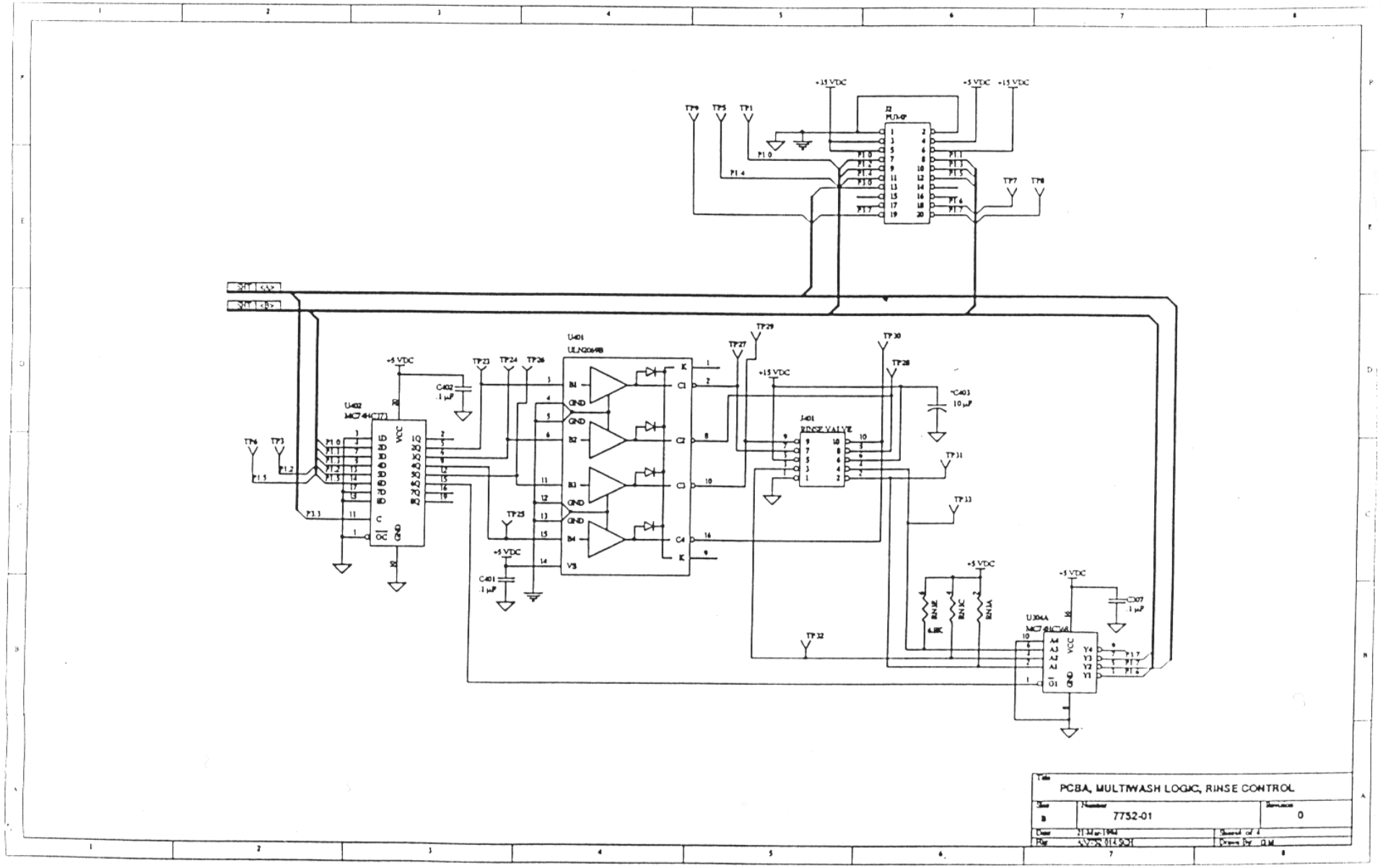

PCBA, MULTIWASH LOGIC, RINSE CONTROL

Size	Number	Revision
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Date: 21-May-1992	Sheet 4 of 4	
File: WW7752-01.SCH	Drawn By: GLM	

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